MANUFACTURING PRIMERS IN THE SMALL SHOP: HOW IT IS DONE (PART I OF A SERIES)

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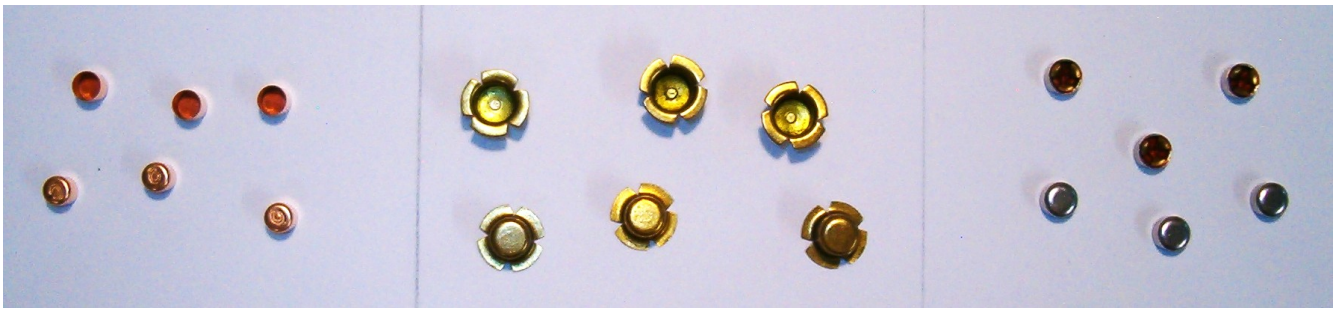
SUMMARY

This is the first installment in a series which will develop a system for the manufacturing of primers, specifically number 11 percussion caps for muzzle loading rifles and pistols, musket caps, and boxer type large rifle primers. After describing the necessary features of these products, a process will be presented which can consistently produce correctly sized primers of commercial quality and reliability.



The object of this series: the production of number 11 percussion caps (left), musket caps (center) and large rifle primers (right)

INTRODUCTION

Like many shooters, I am aware of the fickle nature of our ammunition supply. Scarcity of ammunition is a problem that comes and goes, but no matter what happens it always recurs. The causes of scarcity are many, but they include the destructive intervention of politicians, intermittent heavy demands for ammunition created by the government itself, and panic buying by the public when many fear that ammunition will disappear forever.

The fortunes of ammunition companies must also have some influence on this situation, because they are obliged to deal with issues of securing business financing, promoting profitability by selling those types of ammo which are most in demand, and cutting back on runs of products which do not generate high returns.

As a remedy for ammunition scarcity, I have always favored measures which guarantee self-sufficiency, and one of the most reliable avenues of self-sufficiency in the matter of ammunition would seem to be reloading. However, reloading is not the panacea which some wish it to be. When ammunition becomes scarce, the components from which it is made also disappear. To the extent that reloading relies upon the recycling of spent casings and spent primer cups, there is a limit to how many times the remnants of used ammo can be revived.

The only enduring solution to the problem of ammunition scarcity is to develop a system for making components in small, decentralized shops, from primary materials. This suggestion may seem fantastic to many, but I am here to prove that it is not. With a little effort, a system can be developed to manufacture primers on a small scale.

WHY YOU SHOULD LEARN TO MANUFACTURE PRIMERS

My reader may, with some justification, ask why one should take the trouble to learn to manufacture primers. The short answer to this is that all of us who cherish the right to bear arms, and enjoy the opportunity to shoot them, should learn how to manufacture all components of ammunition. This means bullets, propellants, and casings as well as primers. I have chosen primers as a starting point because there is already a wide audience interested in recycling spent commercial primers. This has given rise to the sale of products such as Prime All, and perhaps other expedient, impact-sensitive fillers for recharging spent primers. You may wish to refer to my prior article which evaluated the Prime All product (https://www.josreichert.com/articles/).

The key aspects of the process developed for manufacturing primers will be repeated in the systems we develop for making bullets, propellants and casings. Having systems for making these components implies *process control*, the implementation of which is critical to any type of *manufacturing*. All of this becomes clearer if we distinctly define what is meant by the term *manufacturing primers*.

WHAT IS MEANT BY THE TERM "MANUFACTURING PRIMERS"?

As used in modern trade and business, the term *manufacturing* ,means more than simply *making*. In the case of tangible products, it means that the things we make are predictably alike, their similarity arising from the fact that they all share those common properties that give them a useful and reliable character. In the case of primers, this means that we *manufacture* them when we identify the qualities that make for a good primer, insuring that quality is incorporated into all our output, and conscientiously eliminate those properties which impede their intended function. If we are to manufacture primers, we must set up a process which will, insofar as possible, guarantee that all the primers we make will meet the following standards:

1. Whether caps for muzzle loaders, or primers for cartridge ammunition, all primers are cups designed to contain a compound which will ignite vigorously when struck with sufficient force. Therefore, they should be made of a material sufficiently strong to contain the force of the explosion caused by ignition, and direct it into the breech of a muzzle loader or the cavity in a cartridge.

2. The primer cup, and the primer anvil in the case of cartridge primers, must be made of a material that will not react with the explosive filler. Also, the body of the cup must be somewhat ductile, so it may expand over the nipple of a muzzle loader, and in the case of a cartridge primer flow and seal in the gases generated by combustion of the propellant.

3. The dimensions of the cups should be closely controlled, so that they will fit the features of the components with which they will mate. Muzzle loading caps must be a tight and clinging fit with the nipples on which they are placed. Cartridge primers must fit the primer ports in the cartridges where they are installed. They must insert easily enough that they are not a nuisance to place, but tightly enough to have good contact with the walls of the port and, on firing, expand into them to create obturation.

4. The priming formula we compound must be up to the task it is to perform, which means that it can produce reliable ignition of our propellants, be stable in contact with the material of which the primer cups are made, and not deteriorate in contact with any of the other materials present in the cartridge. Moreover, if we are using a mixture of chemical ingredients to prepare our priming mixture, it is absolutely essential that they be completely combined by a process which will result in complete incorporation. (The instruction to "mix the ingredients until a uniform color is produced" will yield utterly random results, completely unacceptable for *manufacturing primers*.)

5. Once we are producing primers, the next challenge is to test them for reliability. At a minimum, this will demand that we devise an impact tester which we can set to apply a repeatable impact force to our test specimens. The force applied must be equal to that of the weakest acceptable firing pin impact, as established by recognized military and civilian firearm standards.
6. It almost goes without saying that all of these objectives must be met through a process that is safe. We want to emerge from our work in one piece.

This is a general description of the targets we must hit if we aspire to manufacture primers, and they define the technical challenges we must overcome if we are to devise a successful process. In different words, how can we fulfill all these requirements with the technical information, materials, tools and skills available to us?

This is the first part of a series which will elaborate on this topic, in which I will explain in detail the processes I have worked out to achieve the desired outcome.

GATHERING INFORMATION

I think it accurate to say that most shooters and reloaders are not beginning this quest with a blank slate. Reloaders, in particular, have acquired a large store of knowledge of large rifle primers acquired by a sense of touch. They can feel when a primer is seats properly, and that same tactile sense tells the when something is amiss with their primers, or the primer port on the cartridges they are using. They know if fired primers appear “normal” after firing, and they can feel the ignition their primers initiate when they fire the cartridges they have reloaded. This experiential knowledge can be used to test whether the process they adopt for manufacturing primers is yielding a seriously flawed product.

The daily experience of shooters and reloaders is valuable and not to be ignored. Indeed, their evaluation is the factor that makes or breaks commercial primer manufacturers. Customers may not be able to set up a primer factory, but they know when primer manufacturing has gone seriously wrong.

The customers’ experience is crucial to setting up a system of manufacturing primers, but it is not sufficient, in itself, to permit us to implement a consistent, sustainable system for a product of consummate quality. We need access to knowledge hidden behind the walls of the factories where quality primers are made.

SOURCES OF TECHNICAL INFORMATION, AND THE NEXT INSTALLMENT OF THIS SERIES

There are very few books that unambiguously reveal the processes implemented by respected ammunition companies. Fortunately, there are some information resources which are very good indeed, some of it specific to the narrow topic of manufacturing primers. There are also more general works covering the topics of chemistry and metal forming technology with which we may supplement our manufacturing knowledge.

I have located two books which address primer manufacturing in specific terms. The most recent is Frost, George E., *Ammunition Making*, Washington D.C., NRA Publications, 1990. The second predates Frost's work by seven decades, namely, Hamilton, Douglas T., *Cartridge Manufacture*, New York, The Industrial Press, 1916. Both of these works are reviewed in our *Bibliography*, which you may read free of charge by visiting our *Free Resources* page (https://www.josreichert.com/free-resources/).

Three additional books must be mentioned at this point, because they contain information which which makes it possible to implement the procedures outlined in *Ammunition Making* and *Cartridge Manufacture*. Davis, Tenney L., *The Chemistry of Powder and Explosives*, New York, John Wiley and Sons, 1941, provides formulas and instructions for the preparation of priming compounds; it also appears in our *Bibliography*. The second of the trio is Ostergard, D. Eugene, *Basic Diemaking*, New York, McGraw-Hill, 1963; it is best read in conjunction with Donaldson, Cyril, *et al*., *Tool Design*, New York, McGraw-Hill, 1973. These books are mentioned because they explain the fabrication of punching and drawing tools, a craft essential to making primer cups and primer anvils.

In Part II of this series, I will outline the overall primer manufacturing process, identifying the types of metalworking tools which are required to produce them on a scale within the capacity of the small workshop. The process, as I intend to describe it, is drawn from the works listed in the two preceding paragraphs. However, I will not cross-reference every step of my system by listing the chapter and verse on which each discrete step is founded. Therefore, if the reader has access to the works listed above, I would urge him to review them. Chaptes 1 and 2 of *Basic Diemaking,* and Chapter 10, parts 10-4 through 10-8 of *Tool Design* , will be found especially relevant to the processes I will discuss.